## ABSTRACT OF THE INVENTION

An improved x-ray tube cooling system is disclosed. The system utilizes a shield structure that is connected between a cathode cylinder and an x-ray tube housing and is disposed between the electron source and the target anode. The shield includes a plurality of cooling fins to improve overall cooling of the x-ray tube and the shield so as to extend the life of the x-ray tube and related components. When immersed in a reservoir of coolant fluid, the fins facilitate improved heat transfer by convection from the shield to the to the coolant fluid. The cooling effect achieved with the cooling fins is further augmented by a convective cooling system provided by a plurality of fluid passageways formed within the shield, which are used to provide a fluid path to the coolant. In particular, a cooling unit takes fluid from the reservoir, cools the fluid, then circulates the cooled fluid through the fluid passageways. One or more depressions of "V" shaped cross section defined on the surfaces of the fluid passageways serve to facilitate nucleate boiling of the coolant in the passageway, and thereby materially increase the heat flux through the passageway to the coolant. Additionally, one or more extended surfaces disposed on the surfaces of the fluid passageways also facilitate a relative increase in the rate of heat transfer from the shield structure to the coolant. After flowing through the fluid passageway, the coolant is then discharged from the fluid passageways and directed over the cooling fins. In some embodiments, the fluid passageways are oriented so as to provide a greater heat transfer rate in certain sections of the shield than in other sections. Also disclosed is an improved braze joint for connecting the shield to the x-ray tube housing.

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